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FINAL REPORT CLAPPER RAIL SURVEY
AND INVESTIGATION STUDY

BY

JOHN ONEY



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Final Report

Clapper Rail Survey
and
Investigation Study



GEORGIA GAME AND FISH COMMISSION

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and
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by

JOHN ONEY, Project Leader



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Atlanta, Georgia

Game Management Division

Federal Aid Project

Georgia W-9-R

FULTON LOVELL, Director

1954 Edition

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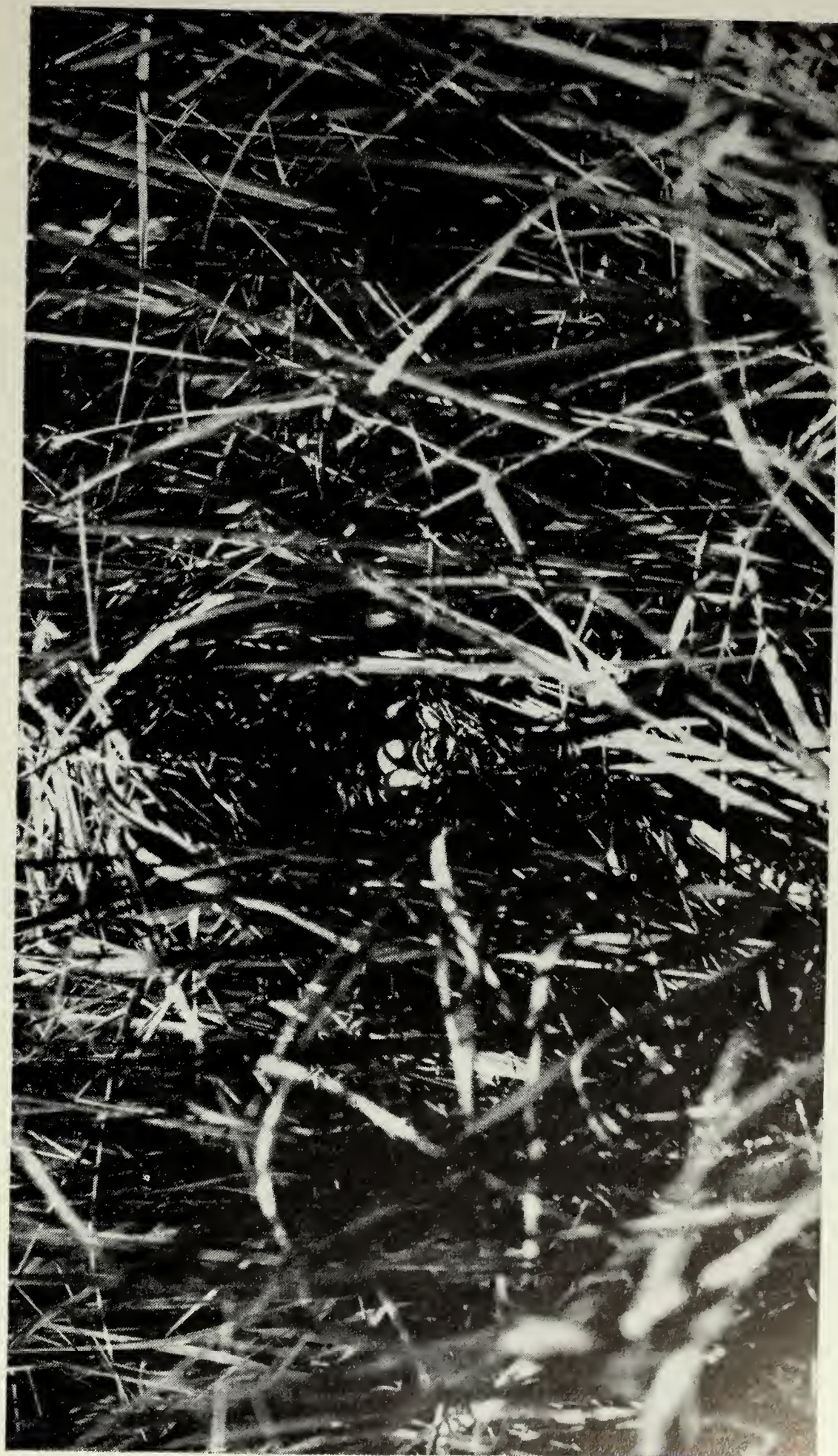


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Clapper Rail (*Rallus longirostris waynei*) Nest

INTRODUCTION

The Georgia State Game & Fish Commission began a research investigation of the clapper rail in July 1947. This study was carried on under the Federal Aid in Wildlife Restoration program as Research Project 9-R. The project continued from July 1, 1947 until June 30, 1950.

The Game and Fish Commission had become concerned about the number of clapper rail in Georgia. There was not undue pressure from sportsmen in regard to the number of rail, but the State wanted an investigation made of the bird and its status determined in order that proper management practices could be put into effect. Consequently, the study has been concerned with all phases of the life history and management of the clapper rail. Principally, investigations were made of habitat, food habits, nesting, hunting and other factors affecting the rail.

The resident clapper rail of Georgia is Wayne's clapper rail, (***Rallus longirostris waynei***). The following photograph shows the adult bird in a defense attitude. It is a subspecies of the Northern clapper rail, (***Rallus longirostris crepitans***). It is very difficult to separate the two under field conditions. Both species have a light phase and a dark phase of coloration. Furthermore, there is definitely a gradual color gradation between each species. Ridgeway and Friedman (1941), offer the most positive means of separation into subspecies. They state that one may separate Wayne's clapper rail from the Northern clapper rail primarily by the barring of the feathers on the sides and flanks. In the Northern clapper rail the white of these feathers is one half to one third the width of the dark interspaces. Wayne's clapper rail has barring such that the white is nearly the same width of the dark barring. The barring of Wayne's clapper rail is a dark hair brown rather than dusky drab as it is in the northern species.

PROCEDURE

Headquarters for the project was set up in Brunswick which is located approximately in the center of the Georgia



Clapper Rail (*Rallus longirostris waynei*)

coast. A Richardson Sedan Cruiser, twenty-five feet long, was purchased and docked in Brunswick. A boat this size was necessary in order that the large sounds could be crossed in rough weather. The boat had sleeping and cooking accommodations for three persons.

A field assistant, Lou North, was hired to help with the maintenance and handling of the boat during its operation. The assistant also helped in carrying out the various phases of the investigation.

Most phases of the study required extensive field work which was carried out on foot in the marsh. Walking in the marsh could be done only during the period of about four hours at low tide. Foot travel at high tide is practically impossible.

A small cub type airplane was used frequently throughout the study for mapping and making general observations.

HISTORY

Arthur Cleveland Bent (1926) has compiled the bulk of the existing data on clapper rail. His sources of information were Audubon, Bachman, Wilson and many others that had experience with these birds. These gentlemen gave accounts of the rail during the years from 1832 to 1896. They were quite impressed with the number of birds and wrote descriptions that are almost unbelievable. Audubon states that it was not unusual for an "egger" to gather a hundred dozen eggs in one day. He has further stated that as many as sixty birds could be killed in four hours. While most of these events concerned the Northern clapper rail, the Wayne's clapper rail was apparently as abundant.

Very little can be added to Bent's information as applying specifically to Georgia. Apparently egging was more difficult in Georgia than it was in the north. This is easily understood since the tide conditions and vegetation are so different. Negro hunters were the principal regular shooters of the clapper rail, or "marsh hen" as it is known locally. Most white people did not hunt the marsh hen since they were not considered to be "fitting sport". The marsh hen has become a game bird only

since improved roads and better transportation has increased the hunting pressure on other game and forced the sportsman to find other hunting species. Better transportation has, in a manner of speaking, advertised the sport to many more people since persons from all over the State can more easily hunt the birds.

In Georgia people along the coast speak of the large number of hens that could be killed a "few years ago". They relate that it was not unusual to find 30 or 40 birds on one small raft of dead vegetation. No similar indication of numbers was ever noted during the study. However, it is, at the present time, possible to kill approximately 100 birds on one tide provided that the tide be high enough.

Locally, people speak of the large number of birds that are killed by hurricanes, but no evidence of this being true was found during the investigation. There is a great shifting of populations as a result of these storms since the high storm tides cover all of the vegetation and the strong winds drive the birds inland where many are killed with clubs in the hands of local people.

Storm tides during the nesting season could be very damaging if the waves became strong enough to destroy the eggs. Generally, people believe that the marsh hen constructs its nest in such a manner as to allow the nest to float, on the tide, up and down the surrounding grass stalks, and when storm tides rise above the grass the nests and eggs float free into the shore where they are destroyed by waves. Three or four persons have insisted that they have found dozens of nests with eggs still in the nest floating freely along the shores after a storm tide.

This study has not substantiated any of these statements.

Very little recent work has been done on the clapper rail. A report on "Nesting Habits of the Clapper Rail in New Jersey" by E. L. Kozicky and F. V. Schmidt (1949) has been published in the *Auk*. The data contained in this paper on the Northern clapper rail and the findings of this study are essentially in agreement. Differences that occur are chiefly due to the differences in habitat.

CLAPPER RAIL HABITAT

The salt marsh of the coast of Georgia is one of the largest in the United States. The total acreage of actual salt marsh vegetation is 308,177 acres. If all the brackish marsh be included the area would be near 350,000 acres. This figure does not include the area occupied by the sounds, rivers and creeks, nor the area of islands in the salt marsh. This is the habitat of Wayne's clapper rail and the area with which this study has been concerned.

Attached to this report are two maps which show the principal types of vegetation and their location along the coast of Georgia. The maps also show the location of the study areas which will be discussed later in this report.

MAPPING TECHNIQUE

The two maps of the U. S. Coast and Geodetic Survey which cover the coast of Georgia were used as base maps. The scale of these maps is 1:80,000.

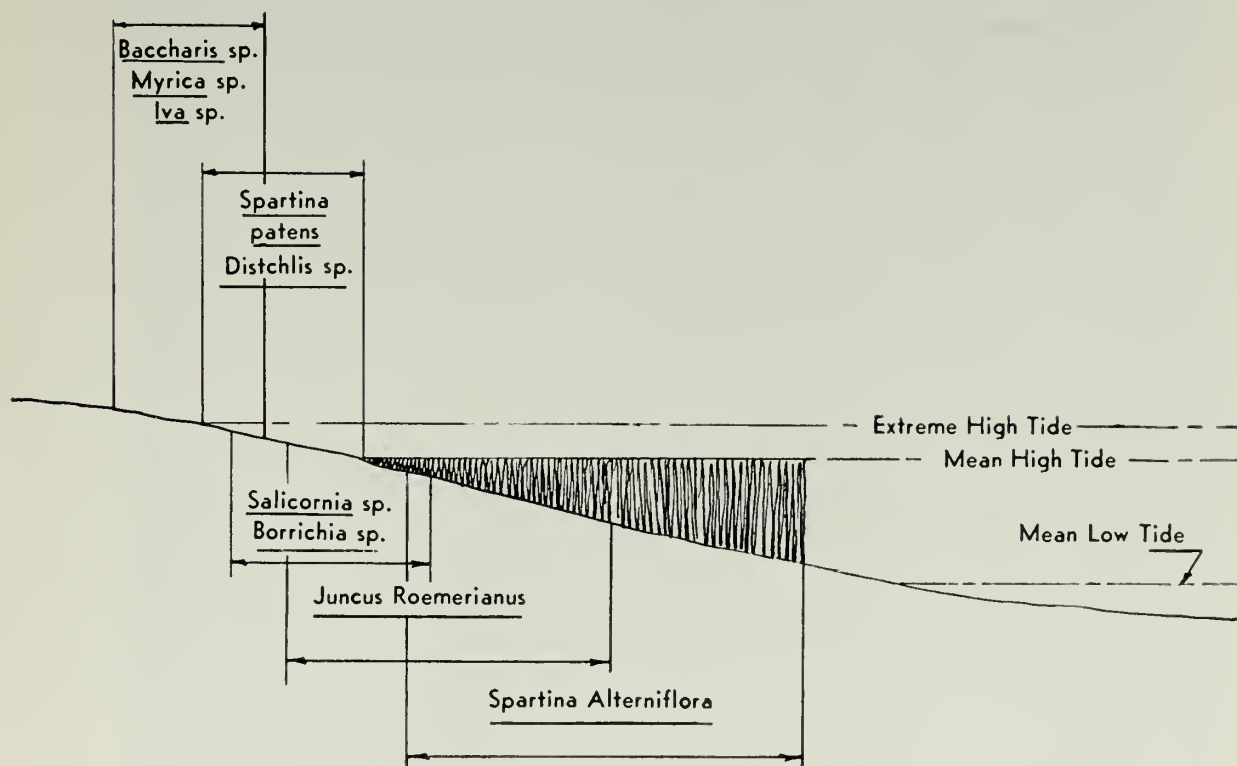
Aerial photos were purchased from the U. S. Army Air Forces and used in mapping the vegetation. A small cub type airplane circled areas of marsh while an observer plotted the vegetation type upon the aerial photos. This information was then transferred to the base map. Field work in the marsh substantiated the identification of the grass type.

In mapping the marsh, an attempt was made to use a boat on high tide. This method was not effective because the observer could not determine how far the grass type extended from the river's edge.

THE SALT MARSH

A well ordered ecological study of the marsh has not been made since that particular type of study was not a part of the project. However, to best describe the marsh one might start from mean low tide and proceed to name the major plants encountered ascending to a level above the reach of extreme high tides. The names of the grasses follow Small's **Manual of the Southeastern Flora** (1933).

Pine, Palmetto &
Cedar



The tide condition along the coast of Georgia is an important factor influencing the marsh vegetation. Due to the slightly concave effect of Georgia's shore line the tide normally rises higher in this State than in the neighboring states. The range in tide between high and low is fairly large, the natural rise being somewhere between six and nine feet above mean low water. Because of this, the bulk of the marsh land falls into the cord grass, (***Spartina alterniflora***), zone. The following aerial photograph shows a part of this cord grass marsh and the characteristic drainage pattern of the marsh.

The band of vegetation between the upland and the cord grass zone is from three to ten feet wide. It is usually black rush, (***Juncus Roemerianus***), or salt grass, (***Spartina patens***). This zone is so narrow, when present at all, that it could not be mapped upon the scale map used.

Spotted throughout the marsh are small areas of woody glasswort, (***Salicornia* sp.**), and sea ox eye, (***Borrchia* sp.**). These areas are usually only a few square feet in extent. The woody glasswort and sea ox eye appear where the ground rises above the cord grass zone. This occurs rather frequently at the mouths of natural drainage ditches where the overflowing tide has raised a levee above the surrounding marsh.

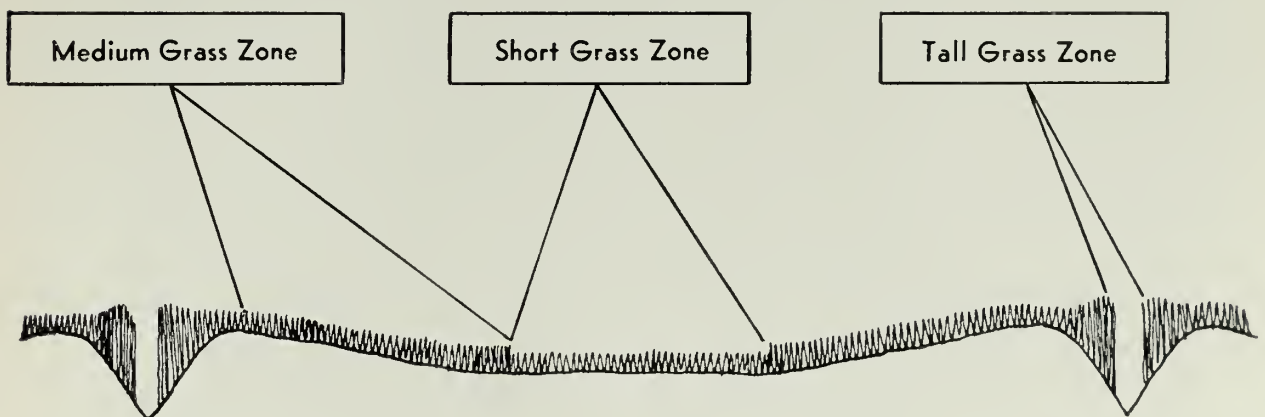


The Cord Grass (*Spartina alterniflora*) Marsh

Without the influence of a large amount of fresh water, the cord grass, (*Spartina alterniflora*), zone is a pure stand of the species except where the woody glasswort and sea ox eye appear as discussed above.

THE CORD GRASS MARSH

The cord grass marsh occupies the largest area of the salt marsh. The grass varies in height from eight inches to six or eight feet. Although there is this difference in height, the grass appears from a distance to be nearly level. This is apparently due to the cord grass' sensitivity to water level. Within the cord grass marsh there are usually three zones of grass which vary in height and density. The profile diagram below shows the position of the three zones in this marsh.



The Tall Grass Zone: The cord grass of this zone grows on the edge of all the natural drainage ditches, creeks and rivers. The soil here is a very soft mud. There are on the average 110 plants per square yard. The plants are from four to ten feet tall. The primary food of the clapper rail, the Square-back Fiddler Crab, (*Sesarma* sp.), lives in this habitat. This zone is apparently of secondary importance to the clapper rail in nesting habitat preference.

The zone of tall cord grass grades off gradually into the medium cord grass zone. The following photograph shows the height of this grass.

The Medium Grass Zone: This zone is not always distinct from the tall and short grass zones. The primary factor accounting for this zone is apparently the height of the levee that is formed by tide water overflowing the marsh since this zone grows on the gentle slope of the levee away from the gut.* This zone ap-

*Small drainage ditches which are usually dry at low water.



Tall Cord Grass (*Spartina alterniflora*)

pears to develop best on the shore opposite the cut side of the river where conditions are better for the formation of a levee. On such a levee the zone may be 20 or 30 feet wide. Under less favorable conditions this zone may be only two or three feet wide. The soil of this zone is firmer than that in the tall grass zone. The Fiddler Crabs, (*Uca*, sp.), are very abundant in this zone. There are on the average 288 plants per square yard in the medium zone. This grass is two to four feet tall.

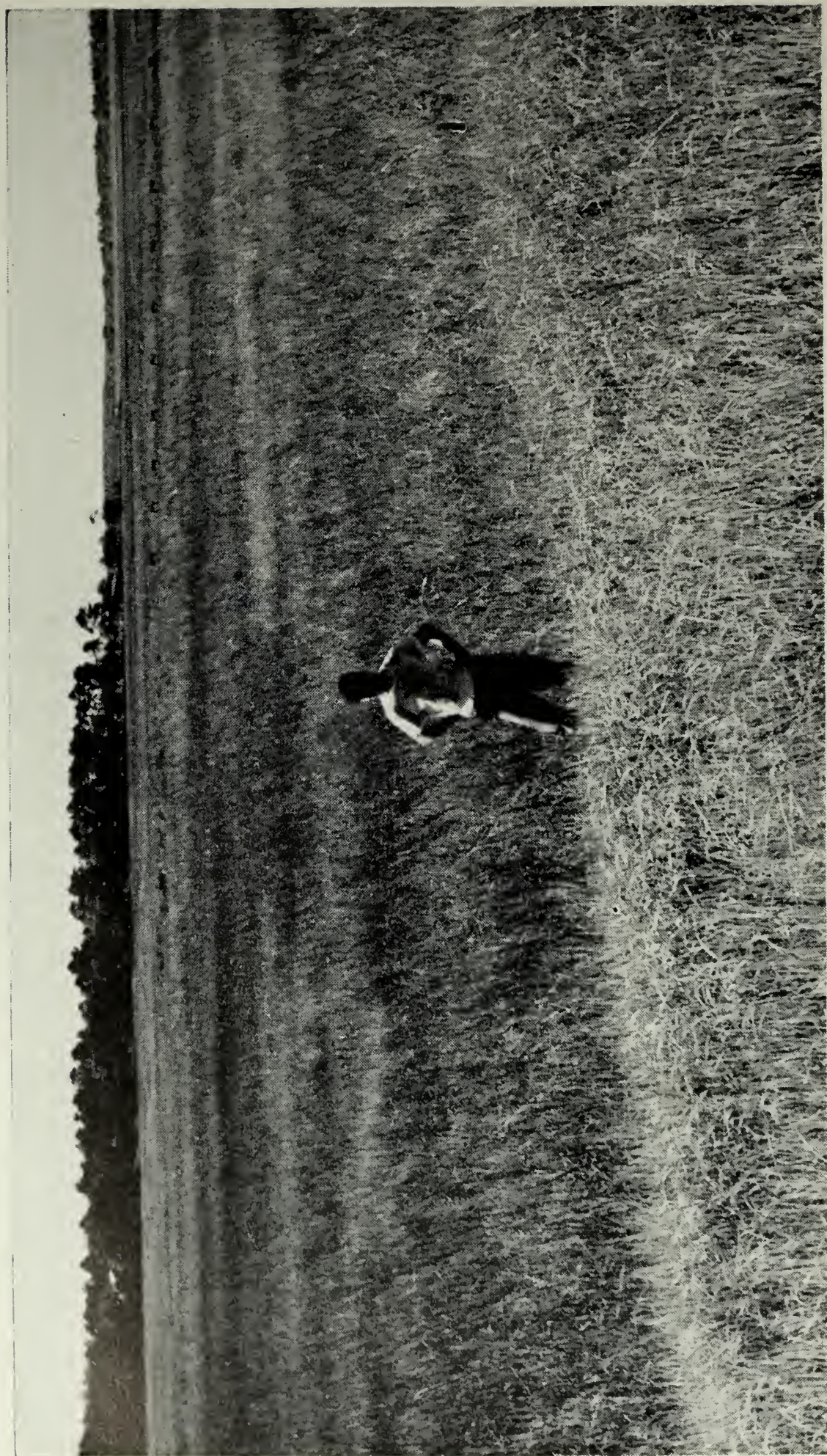
The medium zone of grass is very important in nesting of the clapper rail, since the largest percentage of nests are located in this type of grass. The first photograph of the following two shows this zone of grass in the foreground.

The Short Grass zone: The grass of this zone grows in the lowest part of the marsh. The soil in this zone is firmly packed with a high content of sand. There are 362 plants per square yard on the average in this type of marsh. Their height is from five inches to two feet. A small amount of nesting takes place in this zone but is not important nesting habitat. Periwinkle snails, (*Littorina irrorata*), are usually very abundant in this zone. The short grass is shown in the second photograph.

THE BLACK RUSH MARSH

The areas of black rush, (*Juncus Roemerianus*), along the coast are not nearly as large as the cord grass areas and the growth pattern is much different. Black rush grows back away from the edge of the ditches and creeks except where water action is undercutting the banks. Cord grass nearly always grows between the edge of the water and the black rush.

The black rush marsh grows at a higher level from mean low water than does the cord grass marsh. Johnson and York (1915) in their book "The Relation of Plants to Tide Levels" state that the altitude levels for cord grass are: lower limit 1.5 ft., upper limit 6.50 ft. and, for *Juncus Gerardi* lower limit 7.25 ft., upper limit 8.25 ft. These measurements are from mean low water. They further state that *J. Gerardi* is usually separated from the cord grass by a band of salt grass, (*Spartina patens*). This is not true along the coast of Georgia. However, the *Juncus* in Georgia is *J. Roemerianus* and not *J. Gerardi*. This difference in species may reflect a difference in tolerance to submergence,



Medium Cord Grass (*Spartina alterniflora*)



Short Cord Grass (*Spartina alterniflora*)

or some other equally important factor of distribution which permits the lower limit of *J. Roemerianus* to be nearer the upper limit of the cord grass.

Under favorable conditions black rush grows to a height of about four feet. The thin stalks are easily blown into a tangled mass and their sharp points make passage through the tangles very difficult.

Clapper rail foods are generally abundant in areas of black rush, but rail are not usually found in large areas of the vegetation except about the edges. The following photograph shows the darker areas of black rush invading the cord grass marsh.

ABANDONED RICE MARSH

Old abandoned rice fields in the salt marsh that were once diked and cultivated are interesting mixtures of marsh vegetation but they are not important areas to the clapper rail.

These areas are now grown up in black rush, salt reed grass, (*Spartina cynosuroides*), and cord grass. Where these areas are subjected to considerable fresh water and little tidal action, the principal plants are water millet, (*Zizaniopsis* sp.), wild rice, (*Zizania* sp.), bulrush, (*Scirpus* sp.), *Peltandra* sp., and many other associated species.

FOOD HABITS

In gathering the food habits data the primary purpose was to learn the preferences of Wayne's clapper rail, (*Rallus longirostris waynei*). However, due to the manner in which the gizzards of the birds were collected it seems very probable that some gizzards were taken from the Northern clapper rail, (*Rallus longirostris crepitans*). The winter range of this bird overlaps that of the Wayne's clapper rail. Because of this fact it has been necessary to list the findings as the food habits of the clapper rail, (*Rallus longirostris*). The bulk of the data represents the gizzard contents of Wayne's clapper rail.

The clapper rail does not possess a crop; therefore, the gizzard was used in the food habits determination. These gizzards were collected in this manner. Just preceding the 1947 hunting



Black Rush (*Juncus Roemerianus*) invading Cord Grass (*Spartina alterniflora*) Marsh.

season, four ounce glass bottles containing formaldehyde were distributed to nearly all of the boat landing owners along the entire coast of Georgia. These landing owners agreed to fill the jars with gizzards taken from the hunters kill and record the date, place and height of the tide on a sticker on the outside of the bottle. Cooperation in collecting the gizzards was excellent. There were 669 gizzards collected during the 1947 hunting season.

The findings of this report are representative of the food habits for October and November only. All of the gizzards taken were from birds killed on the highest rise of the tide. This means that the birds were probably killed at least two hours after they could have fed. One would expect to find the gizzards contents in about the same stage of digestion. This was not the case. The ranges were at all possible extremes both in volume of content and in stage of digestion. Gizzards ranged in volume from completely empty to 6.2 cc. The content range in stages of digestion was from finely ground material to whole bodies of insects and crabs.

METHOD OF ANALYSIS

Of the 669 gizzards collected, 118 were either completely empty or had a volume too small to measure; consequently, these were removed. There remained 551 records. It was believed that because of the small number of different foods taken and due to the lack of a crop it would be entirely justifiable to use the gizzards that were less than one-quarter full. Gizzards less than one-quarter full are usually discarded (Martin, Gensch and Brown 1946). The largest volume of the series was arbitrarily selected as a full gizzard. Consequently, the data was compiled using all of the different volumes. It was also compiled after the records (267) had been taken out that did not contain the volume of one-quarter of a full gizzard. These two techniques of compilation were tested statistically. A significant difference was found indicating that the data would be distorted if the volumes of less than a quarter full were used. Therefore, the following list represents the food of 284 clapper rail collected in October and November 1947 along the entire coast of Georgia.

The percentage of volume figure indicates the amount of each particular food found on the average in a gizzard. The

percentage of occurrence figure shows the number of times it was selected. In all cases the figures following the food names are the amounts of that particular food in so far as it could be identified.

Clapper Rail Foods	% By Vol.	% By Occ.
PARASATIC WORMS, <i>Ascaridae</i>	traces	
SNAILS		
<i>Littorina irrorata</i>	14	37
<i>Melampus</i> sp., <i>Nassarius obsoleta</i> , <i>Polygyra</i> sp.	traces	
CLAMS, <i>Molulidae</i>	traces	
CLAM WORMS, <i>Nereis</i> sp.	traces	
SHRIMPS, <i>Peneus setiferus</i> and <i>Palemonetes</i> sp.	traces	
CRABS		
<i>Sesarma cinereum</i>	33	58
<i>Sesarma reticulatum</i>	15	37
<i>Sesarma</i> sp.	6	17
<i>Uca</i> sp. (with traces of <i>Uca pugilator</i>)	14	45
<i>Eurytium limosum</i>	3	17
<i>Panopeus herbstii</i>	1	1
Unidentified crabs	2	7
<i>Callinectes</i> sp. and <i>Pinnotheridae</i>	traces	
INSECTS		
<i>Phalaenidae</i> (— <i>Noctuidae</i>)	6	12
Other insects, listed below	3	
Undet. <i>Orthopetera</i> , undet. <i>Tettigoniidae</i> , undet. <i>Acrididae</i> , <i>Neoconocephalus triops</i> , undet. <i>Gryllidae</i> , <i>Gryllus assimilis</i> , <i>Scapteris-</i> <i>cus</i> sp., <i>Schistocerca americana</i> , <i>Melanoplus</i> sp., <i>Blattidae</i> , undet. <i>Dermaptera</i> , <i>Anisolabis</i> sp., <i>Hemiptera</i> , <i>Pentatomidae</i> , <i>Acantocephala</i> <i>declivis</i> and <i>A. sp.</i> , <i>Leptoglossus phyllopus</i> , undet. <i>Lepidoptera</i> , <i>Diptera</i> , <i>Hylobius pales</i> , <i>Sphenophorus</i> sp., undet. <i>Hymenoptera</i> , un- det. <i>Ichneumonidae</i> , <i>Gambrus bituminosus</i> , <i>Crematogaster</i> sp., <i>apis mellifera</i>		
SPIDERS, <i>Lycosa</i> sp. and <i>Clubiona</i> sp.	traces	
FISH, <i>Poeciliidae</i> and <i>Fundulus</i> sp.	traces	
PLANTS, <i>Spartina</i> , mainly <i>S. alterniflora</i>	traces	

97%

This is the compilation of foods and the volumes in percent which should be found in the average gizzard of a clapper rail in October or November in Georgia.

The important fact to be learned from this work is the food preference of the rail. Is the food that was selected and found in the gizzard in the greatest volume its preference? The fact that it was there in the largest volume does not necessarily prove its preference. However, the percentage of occurrence figure shows by its ratio to the volume that the largest volume food was selected the greatest number of times. Therefore, this tends to indicate that the food with the largest volume is the bird's preference. It is not yet conclusive. The primary point is that, of the foods available it appears that the rail prefers the foods in the descending order of large volumes first.

FOOD AVAILABILITY

It has been observed that the Square-backed Fiddler Crabs, *Sesarma* sp., occur in the marsh in the softer mud along the sloughs and creeks. They are more solitary crabs than the Common Fiddler Crabs, (*Uca*, sp.). The former do not appear to be as abundant as the latter, yet the data shows that the Square-backed Fiddler Crabs are the preferred food. The first of the following pictures shows the Square-backed Fiddler Crabs with *Sesarma reticulatum* on the left. The other two small crabs are *S. cinereum*. The *S. reticulatum* is the larger of the two and its back is much more convex.

It is possible in the gizzard analysis to separate the two species on the basis of the movable finger of the claw. *Sesarma reticulatum* has a single straight row of hard nodules following the curve of the claw on the dorsal surface. There are from 3 to 4 nodules in the females and 7 or 8 in the males. The dorsal surface of the movable finger in *S. cinereum* is "pebbly" with similar nodules which do not follow a straight line.

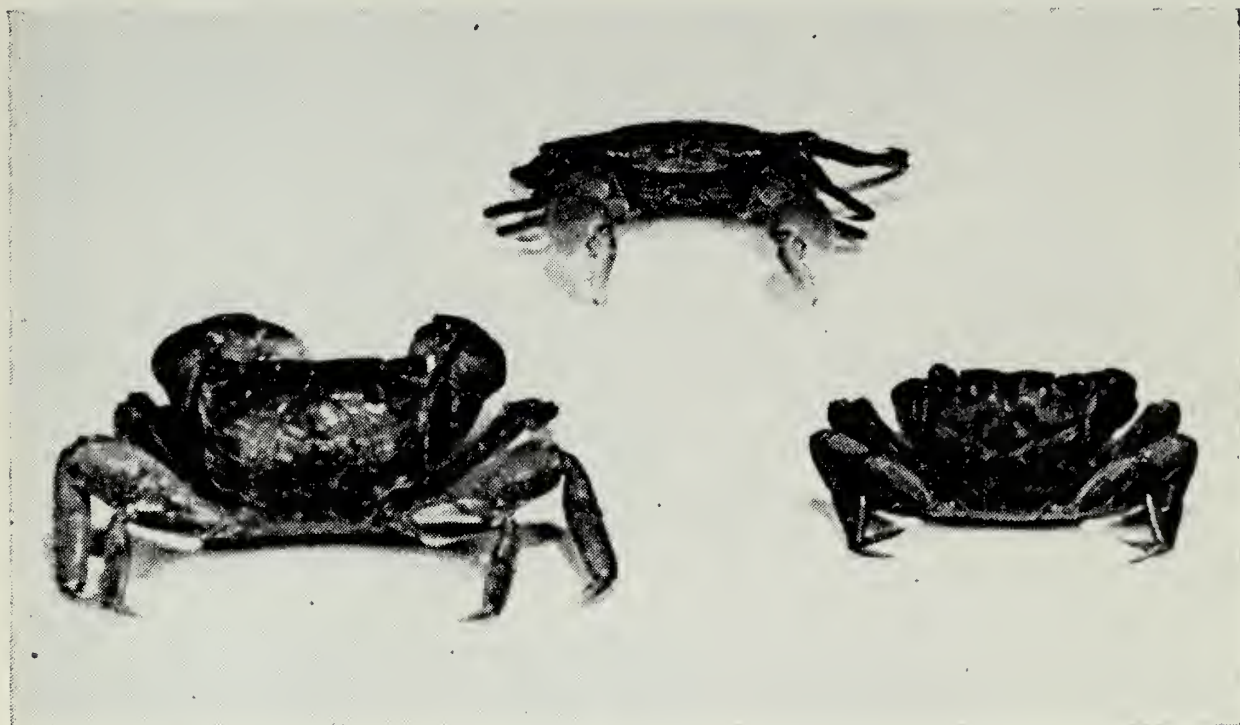
The Common Fiddler Crabs, (*Uca*, sp.), are found most often on the higher ground in the marsh. They are usually very abundant. The second picture shows two large male *Uca*. sp. in the rear with a female in between.

The manner in which the clapper rail handles the large claw of the male is interesting. The bird grasps the crab with its bill

between the claw and the body. Then holding the crab, it vigorously shakes its head. The claw goes one way and the crab another. The bird then runs over and picks up the body and swallows it. The female crabs do not get the same treatment because both of their claws are of nearly equal size.

The third photograph is that of the crab, (**Eurytium limosum**). It is fairly abundant and seems to be found mostly in the higher marsh. The mud crab, (**Panopeus herbstii**), is very similar in appearance to **E. limosum** and is found in the same habitat conditions. **Eurytium** appears to be the most abundant.

The periwinkle snail, (**Littorina irrorata**), shown in the



Square-backed Fiddler Crabs (*Sesarma reticulatum* and *S. cinereum*)



Common Fiddler Crabs (*Uca Sp.*)



Eurytium limosum

fourth photograph is common over all the marsh. It is ingested whole by the rail and as many as 48 have been found in a single gizzard.

NESTING

TIME OF NESTING

During the latter part of February the marsh hens which have been seen on the mud banks at low tide disappear. Areas which were filled with the rail's song are quiet and it becomes almost impossible to find a clapper rail. The birds are "court-ing" and withdrawing into a concentration on the breeding areas. This leaves sections of the marsh deserted.

Searches for nests usually began by the 15th of March. The first nest was located in 1948, 1949 and 1950 on April 13th, April 20th and April 24th, respectively. They contained six eggs, three eggs and one egg. The photograph at the beginning of this report shows a typical marsh hen nest.

MATING HABITS

Because of the marsh hen's secretive habits it has been very difficult to gather much positive data on its mating habits. A meager amount of observational data indicates that the rail is



Periwinkle Snails (*Littorina irrorata*)

monogamous. Rather frequently two birds were found about a nest that was being incubated. Occasionally during the nesting season in areas of nesting one would see two marsh hens rise and fly a short distance over the marsh.

Several birds were sprayed with bright colored paint in an effort to check on renesting. In one instance a bird was painted as it sat on a clutch of eggs. The following day an unpainted bird was found on the nest incubating the eggs. This tends to indicate that the male and female carry on incubation together. Occasionally two adults would be seen with an average size brood of young marsh hens. This information would tend to indicate that the birds are monogamous and that the male not only helps with incubation but assists in the rearing of the young.

All data, as the preceding and that which follows, were gathered by working on foot in the marsh.

NESTING HABITAT

The people along the coast of Georgia have generally assumed that the marsh hen nested anywhere in the salt marsh and that it built its nest in the tall grass bordering the ditches and creeks. Actually, few people had observed any nests.

Since so little was known about the nesting, this phase of work was begun in 1948 by setting up four principal study areas. The areas were accurately measured off and stakes placed at each corner. These study areas, which were selected at random, were:

AREA	SIZE	VEGETATION
Brickhill River Area	20 acres	Cord grass
Wolf Island Area	20 acres	Cord grass
St. Catherine's Island Area	20 acres	Cord grass
Rockdedundy Area	20 acres	Black rush

These study areas and the areas used are shown on the attached map.

The first three of these areas were entirely the same species of grass and apparently there was little difference in the areas. Yet each differed in the amount of tall, medium and short cord grass. The Wolf Island Area had an abundance of very short grass between the small ditches. The borders of these ditches

had a fine stand of tall cord grass. There was practically no medium height vegetation between the very short and tall grass. On the St. Catherine's Island Area the picture was the same except that the short grass was four to six inches taller and the medium height grass was present as a band two or three feet wide behind the tall grass.

The Brickhill River Area was nearly the same in appearance except that the medium zone of grass was considerably wider and the short grass, while about the same height as that of the St. Catherine's Area, was more dense in growth.

The Rockdedundy Area was the usual tangled mass of black rush. It had cord grass present only along the ditches.

The Brickhill River Area was the only one of the four that produced any nests.

From the nest location data gathered in 1948, it was learned that 68.5% of the nesting attempts were located in the medium height zone of cord grass. Apparently all of the marsh is not suitable nesting habitat and since the amount of medium height grass is the only outstanding difference between the productive and nonproductive areas, further work was planned to study the effect of this medium zone of grass.

In 1949 the Brickhill River Area was enlarged ten acres on each end, making the Area a total of 40 acres. The Area was increased in size in order that more nests might be held under observation for nesting success information. Three additional areas were selected. These were as follows:

AREA	SIZE	VEGETATION
Todd Creek Area	20 acres	<i>Spartina alterniflora</i>
Terry's Creek Area	10 acres	<i>Spartina alterniflora</i>
Back River Area	10 acres	<i>Spartina alterniflora</i>

The Todd and Terry's Creek Areas were selected because they contained a large amount of the medium height grass. The Back River Area was used as a check area. The amount of medium height grass on this Area was low compared to the other areas. This check area was similar to the plot at St. Catherine's in 1948.

In 1948 none of the areas were productive of nests except the 20 acre Brickhill Area which held fifteen nesting attempts. In 1949 on the 40 acre Brickhill Area there were fifty-nine attempts. The Todd Creek Area had seventeen attempts and the Terry's Creek Area had only two. The Back River check area had no nesting attempts.

It would seem from this information that the amount of medium grass on the area is the determining factor in nesting habitat. However, a reasonable doubt might arise to this due to the large difference in the number of nesting attempts on the different areas. Observational data gathered on these areas during the year indicates a difference between the less productive areas and the Brickhill River Area.

The three productive areas of 1949 all contained about the same amount of medium height grass. But there was a distinct difference in the location of the grass. On the more productive Brickhill River Area the medium height band of grass bordered the tall grass which grows along the edge of the gut. On the Todd and Terry's Creek Areas the medium height grass grew in a different location. On these areas this grass was most often found as a wide band in the center of an expanse of short grass where a small ditch had gradually filled in with silt. Correlated with this difference is the difference in the number of nesting attempts.

Apparently the most suitable nesting habitat is that which has a wide band of medium height grass bordering the tall grass along a creek or ditch.

During the 1950 nesting season a major effort was made to locate, by the use of an airplane and boat, areas of medium height cord grass. These areas were checked during the peak of nesting only for "nesting attempts". Twenty-seven areas were checked, and eleven of these, which supported considerable medium height cord grass parallel to a ditch or a creek, contained several nesting attempts.

It is then concluded that there is a definite preference for nesting in the medium type cord grass that borders the tall grass along a small ditch or creek.

NESTING SUCCESS

The use of the terms “nesting attempt” and “nesting success” should be clarified as to the usage in this report. A “nesting attempt” is not always a successful nesting, and a “nesting success” always represent at least one nesting attempt. In the preceding discussion the term “nesting attempt” has been used frequently. The manner in which it was used should not be misinterpreted to indicate the number of birds on the areas discussed. That point will be taken up later.

In 1948 there were 16 nesting attempts held under observation. Fifteen of the attempts were on the Brickhill Area and one was just off the area a short distance. Of the fifteen attempts on the area, fourteen were successful. One was a failure. The success of nesting attempts on the Brickhill Area was 93.3%. The success for all the nesting attempts under observation in 1948 was 87.5%.

During 1949 there were a great many more nesting attempts under observation. A total of eighty-two nests were located on and off the different areas. Of these eighty-two nesting attempts the successful ones amounted to only 36.6%. All of the nesting successes located in 1948 and 1949 were on the Brickhill River study area. There were no known successful nests on the Todd Creek Area even though there were at least seventeen attempts, nor were there any successful nests on the Terry’s Creek or Back River Areas.

In order that the results of the nesting on the Brickhill River Area may be directly compared, the following table is presented:

BRICKHILL RIVER AREA (20 ACRES & 40 ACRES)*

	1948		1949		1950
	20		20-40		20-40
	Acres	Acres	Acres	Acres	Acres
Nesting attempts	15	39	59	25	25
Successful nests	14	19	30	12	18
Percentage of nesting success	93.3%	48.7%	50.8%	48.0%	36.7%

*The original twenty acres was enlarged by adding ten acres to two opposite ends. The data were kept separately in order to give results of twenty acres for three years and forty acres for two years.

NESTING DISCUSSION

The percentage of nesting success given in the table above may be somewhat misleading. The percentage figures show only the ratio between the number of nesting attempts and the number of successes. As an example, the percentage figures of 1949 should not be interpreted to mean that of all the birds on the area only 48.7% or 50.8% nested successfully.

In the discussion of nesting populations which follows later, the birds per acre figures are based upon the number of successful nests and not derived from the percentage of nesting success. It is important that these distinctions be made in order that the data be correctly interpreted into conditions in the marsh. Although there are no factual data available it is believed that nearly all of the breeding birds eventually hatch a successful nest during the nesting season.

Therefore, there is a recognized error in the birds per acre figure in the amount of the number of pairs of birds that did not successfully hatch a clutch of eggs during the nesting season. This figure might possibly be rather high but in all probability it makes up only a small percent of the population.

NESTING POPULATIONS

The only technique available at this time for determining the number of clapper rail per acre is to count all the nests on a given area.

Since all observations indicate that the bird is monogamous it would be logical to assume that each successful nest probably indicates one pair of birds. This study has not revealed the fact that the birds have more than one brood a year; therefore, it shall be assumed in this report that the birds have only one brood each year. Considering these assumptions, on the basis of the number of nesting success, these data are presented for the Brickhill River Area:

	1948	1949	1950		
	20	20-40	20-40		
	Acres	Acres	Acres	Acres	Acres
Birds Per Acre	1.4	1.9	1.5	1.2	0.9

It must be emphasized that these figures cannot properly

be applied to the total area of the salt marsh since the amount of preferred nesting habitat is not known.

Since counting the number of successful nests per acre is the only census technique used it is important to note that there is a definite way in which to judge whether or not a nest is successful. The clapper rail does not leave the piped egg shell in the nest after hatching, so one cannot, by examining the egg shell, determine whether or not the eggs hatched successfully. As each chick hatches, the adult bird, or birds, remove the shell from the nest. The net result is that a nest which on one day holds several eggs is the next day empty. Some predators remove the eggs completely which would give the nest the appearance of hatching successfully. There is, however, one additional fact that prevents the observer from classifying the destroyed nest as successful. As the chicks pip the egg and emerge from the shell, fragments of egg shell less than a square inch in size are jostled into the nest material. These small fragments can be located by removing the top layer of nesting material. The presence of these small fragments indicates that the nest hatched successfully. The following picture shows these fragments in the nesting material.

Gathering chronological data can be helpful in checking on nesting success. Data of this type was kept whenever possible. Through this information it was learned that the incubation period was on the average twenty days but with ranges from eighteen to twenty-two days. It was also noted that occasionally all eggs would hatch on one day with the exception of one or two, which would hatch one or two days later. Apparently, in some cases, incubation starts before the clutch is completed. In other instances incubation is probably delayed one or two days after the clutch is completed.

PREDATORS

Racoons, mink and crows are probably the principal predators of the marsh hen. It is extremely difficult to gather data on this because the marsh is washed clean of nearly all sign every twelve hours. Racoons do the most damage during the nesting season. A nest that was probably destroyed by raccoons is shown in the following photograph. It is interesting to note that in 1949 and 1950 the amount of raccoon sign in the salt marsh



Shell fragments indicating successfully hatched nest

increased threefold over the amount seen in 1948. There is also considerable difference in nesting success during these years.

Raccoons caused considerable damage on the Todd Creek Area in 1949. A chronological chart of nesting was kept on this Area. From the data, it was apparent that five pairs of birds attempted to nest three times. Each nest was destroyed by raccoon. There was not a single nesting success on the Area during the year. From these data, it is evident that the clapper rail will attempt nesting two or three times. It may also be surmised that when storms and the resultant storm tides hit during the nesting season the nest damage may be severe, but renesting should nearly always make up for the loss. No severe storms occurred at the nesting season during the three years of this study and so no data can be presented as to the amount of damage these storms do in the nesting period.

Several storms of near hurricane force occurred in the fall of the year. These storms always blew the marsh hens inland where some were killed by people, but no birds could be found that were killed directly by the storms.

Locally, along the coast, people have believed that unusually high tides have resulted in severe damage to the nests and their eggs. They believe that the nests are so constructed as to allow the nest to float up and down along the guiding stems of grass. Such is not the case. The nest remains stationary and the tide covers the eggs. It frequently covers the eggs to a considerable depth.

Several measuring devices were constructed that measured the rise of the tide water above the ground. These devices were merely a narrow board stuck in the ground supporting a string with a wooden float on one end and a lead sinker on the other. As the tide rose above the ground the float rose also. When the tide flowed out, the float remained in its highest position because the sinker was heavier than the float. This device measured the tide rises of:

Nest height above ground	Float height above ground	Depth of water above eggs
8 inches	21 inches	13 inches
8 inches	21½ inches	12½ inches
13 inches	31½ inches	18½ inches
9 inches	28 inches	19 inches



Destroyed Marsh Hen Eggs

All of the nests where the device was placed hatched successfully. Two of the nests were being incubated when they were covered by the water.

Marsh hen nests are constructed of dead vegetation which is jammed down into the surrounding grass, forming an inverted cone. Often blades of the surrounding grass are folded into the pile, anchoring it in place. A roof is usually placed over the eggs. This is done by pulling several blades of grass together over the nest. A runway of matted grass from the edge of the nest to the ground is usually evident.

During the three years 118 nests were measured; thirty were located in the tall cord grass; 87 were found in medium height grass; and, one was located in the short grass. On the average, the nests were located 458 feet from the nearest creek to hold water at low tide. The extremes are 1200 feet to three feet. The average distance between the nests and the nearest small gut was twenty-seven feet with extremes from one foot to 110 feet.

The average nest was twenty feet from the nearest change in cover. The extremes ranged from eighty feet to three feet, the change in cover being tall, medium or short cord grass.

The nest height averaged 14.8 inches from the ground to the egg level. Extremes were from nine inches to thirty inches. From egg level to the tops of the surrounding grass the average distance was twenty-six inches. Ranges were from fifteen inches to forty-four inches. The average diameter of the nest was ten inches.

The average size of the clutch was found to be 8.2 eggs per nest. The number ranged from five to fourteen eggs. There was not any appreciable decrease in the size of the clutch toward the end of the nesting season, as might be expected with the considerable amount of nest destruction and the high amount of renesting.

Coincidental with the first hatching of the eggs there appears in areas of nesting small constructed platforms which resemble nests which were not completed. None of these platforms were ever used as nests, nor has any definite use been recorded. It is possible that these are used by the adults in brooding the young during periods of high tide. Although clapper

rail are precocial, they do occasionally use their nests for one or two days after hatching.

CENSUS TECHNIQUES

The estimates of rail populations were based on a census of the successful nest on a given area. This technique was used because it is the most accurate method available.

Attempts were made to devise other census techniques. To this end, a variation of the "roadside census" was employed. Using a rowboat and outboard an observer covered at low tide a mile of shoreline through the cord grass marsh. The rail were counted feeding upon the mud flats. The same area was covered repeatedly and it was noted that during low tides at dawn and dusk the largest numbers of birds were counted. Adverse weather conditions, especially strong winds, considerably reduced the number of birds counted over the census area. Although such factors as time of day and weather conditions can be interpolated there is no way to correlate the number of birds seen on the shore with the number of birds per acre or per hundred acres in the marsh.

Occasionally when a shot gun is fired in the marsh the rail will start to sing. It was believed that the birds could be counted as they sang. In order to develop this into a census method a gun was fired at different times of the day and at different stages of the tide. The results were not satisfactory since the birds did not always sing after the shot was fired.

A long heavy rope was pulled through marsh in an attempt to flush the birds. Although birds could be heard singing in the area, none were flushed.

The Brickhill River nesting study area was censused in October of 1949 on a high marsh hen tide. A boat and motor was used to flush all the birds from the forty acre tract. Fifty-three birds were flushed. This amounts to 1.3 birds per acre. It is interesting to note that there were 1.5 birds per acre according to the nesting season census.

The St. Catherine's Island Area was censused at high tide in

October 1948. This area which had no nesting attempts produced fifteen birds in one hour and fifteen minutes. Circumstances prevented a complete coverage of this area.

HUNTING CLAPPER RAIL

Marsh hens are hunted in two ways; on low tide and on high tide. Low water hunting is done as the bird comes down from the grass to feed upon the mud flats. The hunter kills the birds as he moves along the water edge in his boat.

High water hunting is done when a north quadrant wind forces a high "natural rise" tide above the tops of the grass. Such a tide is called a "marsh hen tide". It may well be ten to twelve feet above low water in height.

A north quadrant wind is necessary to produce a marsh hen tide. Without this wind the height of the tide may be only that of the natural rise of about nine feet, or the wind may blow from the west and instead of adding to the tide it may hold the water back and the height of the tide be less than that of the predicted natural rise.

It should be emphasized that the direction of the wind as it influences the height of the tide is an important factor in determining the number of hunters and their success. Frequently the conditions of wind and tide appear to be correct for a successful hunt but the tide's rise, although high enough to permit travel in a boat over the marsh, is not high enough for a good kill. The resultant poor success is due to the birds reluctance to fly. Until a certain height of tide is reached the clapper rail will swim and dive at the approach of the hunter. As the tide becomes higher it can no longer escape in this manner and it will flush from the grass. These conditions often lead the hunter to believe that there are no birds in the area, whereas another six inches rise of tide would have made a large number of rail available to him. A high tide without the proper wind is not suitable for hunting marsh hens. Furthermore, the tide must reach the flushing point to insure a satisfactory kill.

When hunting upon a marsh hen tide the hunter has in the

past either poled his boat or used a motor to propel him over the water and through the grass.

TECHNIQUES OF INVESTIGATION

The bulk of the hunting efforts against the clapper rail are made on a "marsh hen tide". Low water hunting is not done in a large volume because it is not by any means the sporting method of high water hunting.

Fortunately for the investigation, the method of high water hunting lends itself very well to a census of hunting efforts. The height of the natural rise of the tide can be predicted far in advance. If the wind direction is suitable at the time of the high natural tide, then the hunters will be out at the same time of day because the duration of the marsh hen tide is about two hours in length.

Consequently, on the days suitable for hunting on high tide two airplanes with observers were sent out to count each hunter. In this manner, a count, accurate for all practical purposes, is made of the hunting efforts for the clapper rail season.

Since the hunters use boats they usually rent them from fishing camps along the coast. It has been found satisfactory to count their kill as they return to the camps and arrive at an average kill per hunting effort. This has been done by the use of a printed form distributed to fishing camp owners along the entire coast.

THE HUNTING SEASONS

The past three hunting seasons have, for the most part, been quite different one from another.

In 1947, the first year of this project, the hunters were permitted to use an outboard motor in hunting rail. It was a season in which the winds favored the hunter and blew from the northeast during the high natural rise tides. There were by actual count 10,200 hunting efforts during the rail season. On the basis of a questionnaire distributed to the boat landing owners there were 85,680 birds killed.

During this season 77% of the hunters used an outboard

exclusively and another 11.2% used it partly in their hunting efforts.

Just prior to the 1948 open season the U. S. Fish & Wildlife Service announced that it was unlawful to shoot clapper rail from a power driven boat and that all violators would be apprehended. This was in keeping with the law since the Treaty with Mexico in 1937 classed the clapper rail as “considered” migratory and furthermore prohibited the use of power driven boats in hunting migratory birds.

Partially as a result of this new strong enforcement, the hunting efforts against clapper rail dropped in 1948 from 10,200 to 3,830. Tide conditions during this year were not as favorable as the preceding year, but even so this alone would not account for the marked decrease in hunting efforts. The annual kill was determined to be 25,335 birds.

During the year 1949 tide conditions were nearly as good as in 1948. A total of 4,825 hunting efforts were counted and from the data on average kill, obtained at the boat landings, 45,303 birds were killed.

On the graphs attached, the actual heights of the tides are plotted. One can quickly see the small differences between the three years in the number of marsh hen tides.

A summary of the hunting season data* is presented here:

DATE	HUNTING EFFORTS			AVERAGE KILL PER H.E.			TOTAL KILL		
	1947	1948	1949	1947	1948	1949	1947	1948	1949
Oct. 1 -15		2,649	75		7.8	3.5		20,662	263
Oct. 16-31		747	3,800		4.2	11.2		3,137	42,560
Nov. 1 -15		334	50		4.3	1.0		1,436	50
Nov. 16-30		100	900		1.0	2.7		100	2,430
Total	10,200	3,830	4,825	8.4			85,680	25,335	45,303

*The kill data for 1947 was arrived at by multiplying the number of hunting efforts, 10,200, by the average kill, 8.4, taken from a questionnaire distributed to the landing owners.

FT. PULASKI

ACTUAL RISE OF TIDE
MEAN HIGH WATER
OCTOBER

1947 —————
1948 - - - - -
1949



12 Ft.

FT. PULASKI

ACTUAL RISE OF TIDE
MEAN HIGH WATER
NOVEMBER

11 Ft.

1947

1948

1949

10 Ft.

9 Ft.

8 Ft.

7 Ft.

6 Ft.

5 Ft.

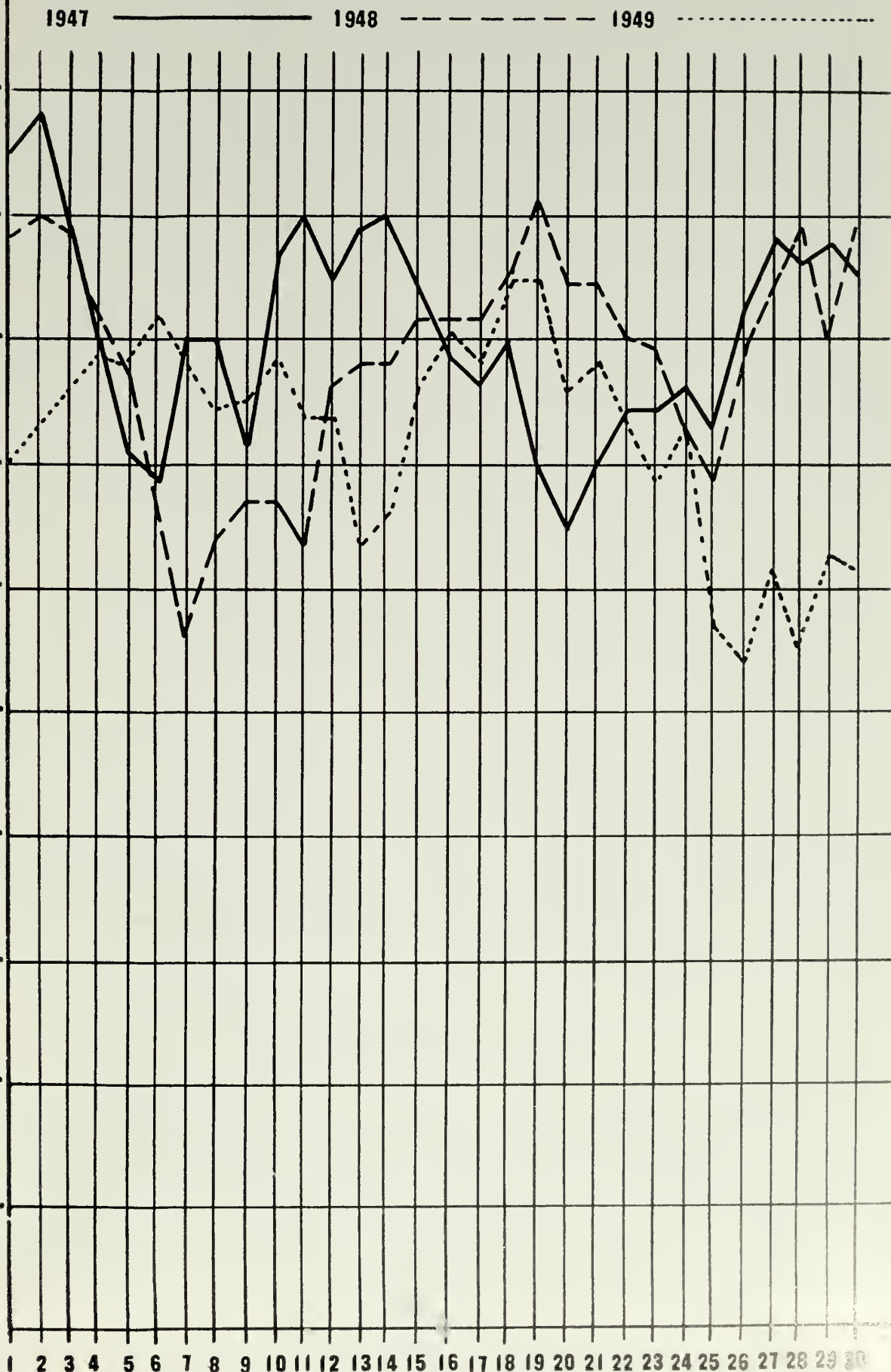
4 Ft.

3 Ft.

2 Ft.

1 Ft.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30



The high hunting effort figure of 1947 is mainly due to the fact that the use of the outboard motor made marsh hen hunting a fine sport for a large number of people. The conclusion is that prohibiting the use of a power driven boat has removed the sport from many of its patrons. It remains for only those people who can either afford to hire a person to pole a boat (at approximately \$8.00 per hunt) or, have sufficient physical ability to do so themselves.

By collecting clapper rail on a high tide some information on sex and age ratio data is now available. This information has been taken from birds which were killed on high tide and represents a better random sample than if the data had included birds killed on low water.

These data are for August, September, October, November and, in part, December of 1949. The age ratio data was gathered using the Bursa technique. This technique is not reliable in Georgia for the month of December.

BASED ON NUMBER OF BIRDS

	MALE	FEMALE	YOUNG	OLD
August	.7	1.0	2.4	1.0
September	1.5	1.0	7.1	1.0
October	1.1	1.0	1.7	1.0
November	.9	1.0	3.3	1.0
December	2.0	1.0	Bursa Character not Reliable	

Very little can be learned from one year's data. If several years' information were available it could be interpreted and recommendations on the season made in accordance with the proper removal of the older birds. Data of this type is very important to the setting of the hunting season.

RAIL MIGRATION

Enforcement of the law prohibiting the use of an outboard motor in hunting marsh hens caused considerable discussion among sportsmen as to the migratory status of the clapper rail.

This study has not been able to gather any factual proof that would answer these discussions.

There are two ways of considering the topic of migration of clapper rail. Legally, the Treaty with Mexico, signed in 1937, classified all rail as "considered migratory". In so far as is known all of the rail are migratory, although the distance these birds may move in their migration is considerably different. The Northern clapper rail migrates from as far north as New Jersey to Georgia. Wayne's clapper rail, the resident bird of Georgia, moves in the winter only a few miles south of its breeding range and does not entirely leave the northern limit of the breeding range. This is more of a population shift than a "migration". This point was established by collection of specimens throughout the years by members of the U. S. Fish & Wildlife Service. There is as yet no banding data to substantiate these collection records.

TRAPPING METHODS

Many attempts were made to live trap and band these birds but no method was devised that would work into other phases of the study and still provide a large number of birds for banding.

A funnel type trap was constructed and baited with corn and small fish. This method did not succeed. Tide action washed the bait away from the trap before the hens had an opportunity to start feeding at the trap; prevention of the captured birds from being drowned by high tide would have been a problem of this method had any birds been trapped.

A variation of this type trap was tried. Using the funnel trap, long leads of wire were staked out from the entrance to the trap. A drive was then conducted toward the trap. It was believed that the birds could be driven into the trap. One bird was trapped in this manner; however, under the conditions of mud and tall grass the birds could not be driven a long distance. They either darted back through the line of drivers or they flushed and flew out of range of the drive. If a fairly large concentration of birds could be found, then a part of the number could probably be trapped in this manner. Since moving a trap this size was very difficult, a long net of fine black mesh thread was used. This net was stretched in the marsh between two stakes. The bottom edge was weighted to the ground and a drive again staged. Even though this technique was tried

several times, the birds could not be driven up to the net where it was expected that they would tangle in the fine thread of the net.

Several attempts were made to capture the birds alive by using a long handled dip net on extreme high tides. A man with the net was placed in the bow of a small boat. He was to dip up the birds from the water or catch them in the net as they flushed. One bird was banded in this manner. Tides high enough to use this method effectively do not occur often enough to make this a practical trapping technique.

DISCUSSION

It is necessary at this point to take stock of the present status of this project and to concern ourselves with the use of the data that have thus far been gathered on the clapper rail.

It has been learned that in regard to nesting there is a definite preference for the medium type cord grass that borders a small ditch or creek. An amount of this grass sufficient to account for the nesting of this bird has not been located.

However, one can, with the present information, make a more or less scientific appraisal of breeding conditions correlated with the annual kill by hunting. This approach is justified since we are interested in removing the annual surplus by hunting methods and by making this appraisal we can tell whether or not hunters are killing a part of the breeding reserve each year. If they are doing this, then it will eventually lead to such a depleted population that there will be no birds to hunt. The primary objective of this study has been to determine if this is true.

From the nesting data in 1948 it was learned that, using a random sample of four, twenty-acre plots, three of which were cord grass, there were 14 pairs of nesting birds or one bird per two acres on these three cord grass areas.

The vegetation map shows that there are 253,153 acres of cord grass salt marsh. There are then 126,576 breeding adult birds or 63,288 pairs resident in this marsh. In addition, this number of birds hatched an average of 8.2 eggs per pair. Without taking into consideration juvenile loss, the population would

be 126,576 adults, plus 518,961 young, making a total population of 645,577 birds. Since there are no data on juvenile loss, they will be assumed in order that the appraisal may be continued. If juvenile losses between hatching and the beginning of the hunting season were as high as 70%, then at the beginning of the hunting season the number of adults would still be near 126,576 birds, plus a survival of 155,689 birds of the year, the total population then being 282,265 birds. At this point in the appraisal the age ratio would be 1.2 young to 1.0 old bird. Actual age ratio data gathered in the field using random sampling conditions showed a ratio at the end of September as being 7.1 young to 1.0 old bird. The ratio for September indicates that the estimate of 70% juvenile loss must be very high. However, using the 70% loss figure, there are at least 282,265 birds available to the hunter, plus whatever the number of Northern clapper rail that migrates as far south as Georgia, plus the migrating Wayne's clapper rail that come from North and South Carolina.

The hunting season surveys show that in 1947 approximately 85,680 birds were killed; in 1948—25,335—and, in 1949—45,303. This annual kill does not approach the kill that could safely be made without damaging the breeding stock.

Sportsmen who hunt marsh hens often do not find any birds. They naturally are inclined to feel that there is a low population of birds. Usually what happens to give this impression is that they have hunted on a high tide that did not quite rise to the level of a good "marsh hen tide". Since the water did not rise above the marsh hen's cover, the bird would not flush as the hunter approached. Until a certain point of high tide is reached the marsh hen will usually dive to escape rather than flush. This trait leads sportsmen to believe that there are not any birds to hunt.

RECOMMENDATION

In consideration of the data and this appraisal that has been made and since the marsh hen can stand a considerable increase in hunting pressure, IT IS STRONGLY RECOMMENDED BY THIS PROJECT'S INVESTIGATOR THAT THE USE OF POWER DRIVEN BOATS BE PERMITTED IN HUNTING CLAPPER RAIL, PROVIDING THE STATE GAME

AND FISH COMMISSION EMPLOY THE MOST EFFECTIVE METHODS OF LAW ENFORCEMENT.

It has been determined that the most effective method of enforcing the laws pertaining to "marsh hen" shooting is to send a Wildlife Ranger with a boat and fast motor into the marsh where he can be seen and recognized by the hunter. He can most effectively check the hunters in the field. His presence will discourage any attempts to kill over the limit.

The manner of hunting on high tide will lend itself to enforcement since it is possible to know in advance the days that law enforcement will be necessary.

Reasons for Recommendation: One might question the advisability of allowing the use of power driven boats in hunting. "Why make the change at all?"

All agencies of Wildlife Management are now greatly concerned with providing enough hunting and fishing for the sportsman. Granted that we may never provide all that is desired, we should try to come as close to this objective as possible. To prohibit the use of a power driven boat in marsh hen shooting removes the sport from a great many hunters. These people join the ranks of the unsatisfied and move us a little further from our objective.

It appears that the thing to do to satisfy the most people involved is to allow the use of power driven boats in hunting clapper rail.

A point of objection to this change may be raised that it would not be fair to other states to allow the use of a motor in Georgia when it is prohibited elsewhere, the point being made that some of the rail killed in Georgia may not have been hatched in Georgia. This may be true, but the percentage of birds hatched out of state that are killed in Georgia must be very low. Some 300 birds were checked during the 1949 season and not one Northern clapper rail was found.

Law enforcement officers may feel that this change in regulations would make their job more difficult since some hunters would use their motor to hunt waterfowl under the disguise of marsh hen hunting. This objection would hardly be valid since the main flights of waterfowl have not reached

Georgia during our marsh hen season. Furthermore, the method of high water hunting can hardly be adapted to killing waterfowl using a motor.

Investigation of hunting methods indicates that more cripples are recovered when a power driven boat is used in hunting. Birds that have been crippled are difficult to recover. The birds are very adept at diving and can stay under water for a long period of time. The type that usually escapes is the body shot bird that falls on the water in a shocked condition. The birds often quickly snap out of this condition and dive under the water. While poling a boat on the high tide it frequently takes some little time to reach a bird that has been shot. This extra time is often enough for the bird to snap out of its shock and escape. With a power driven boat the bird can usually be picked up before the shock can wear off.

Since a satisfactory "marsh hen tide" requires a rather strong wind it makes poling a boat into the wind a "hard work" proposition. Unfortunately, some hunters will leave dead birds that lie upwind rather than exert the extra effort it takes to pole into the wind for the bird. Usually hunting conditions are such that they can kill another bird with the wind more quickly than going after the dead bird. While using a power driven boat these hunters would not find the wind to be a problem in picking up their dead birds.

Precisely, the use of a power driven boat would mean that fewer crippled and dead birds would be left in the marsh.

Some hunters have objected to the use of a motor on the basis that one can cover too large an area. The project investigators have used both methods of high water hunting and have analyzed both carefully. When poling a boat the area covered is much smaller than when a motor is used; however, the smaller area is undoubtedly covered much more closely while with a motor being used the hunter often runs past the hens without flushing them. The use of a motor allows a more even removal of birds from an area rather than a complete removal in a small area.

FUTURE INVESTIGATIONS

The past three years work on the clapper rail has been a good start towards the management of the bird. There is con-

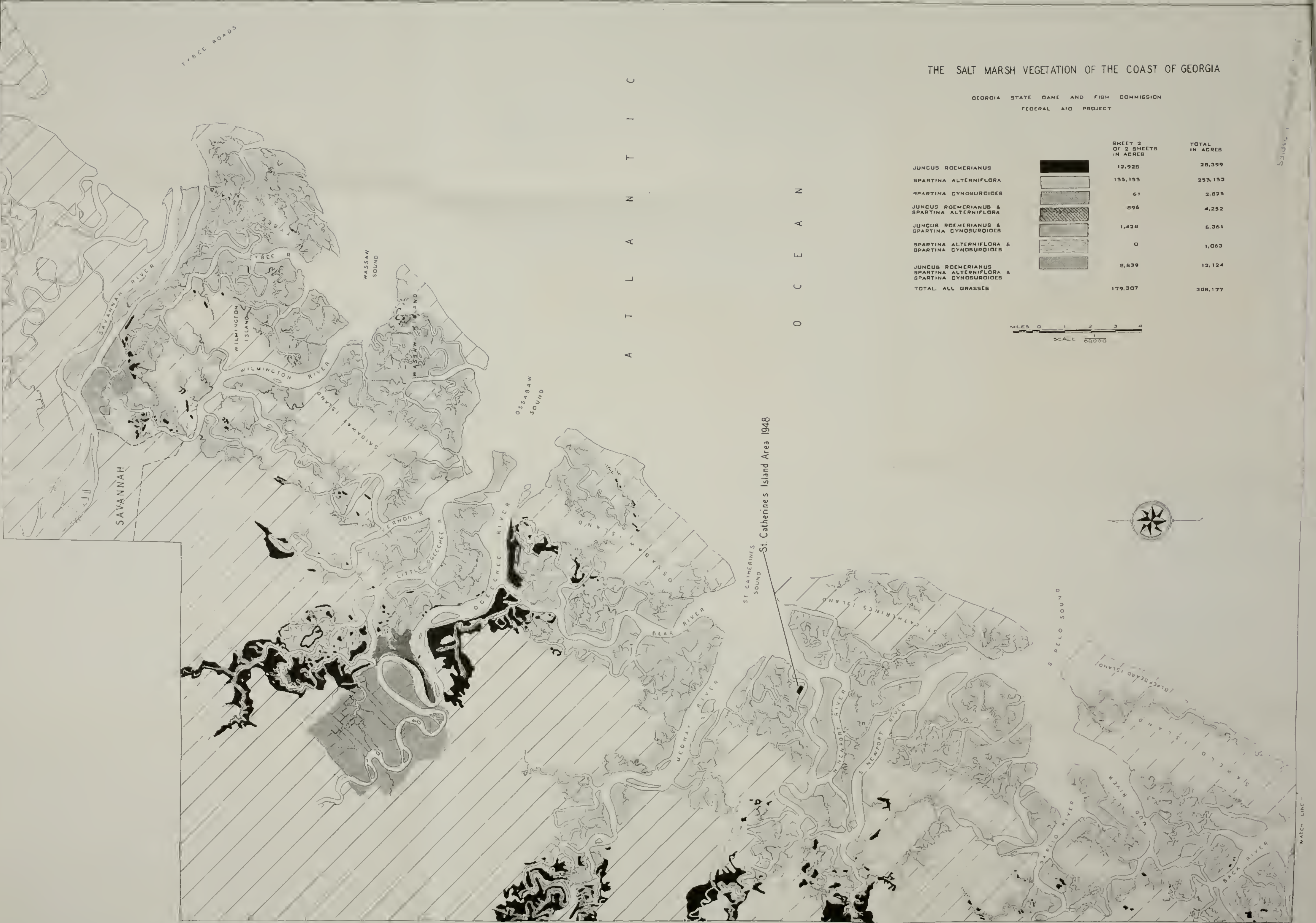
crete evidence that warrants the recommendation in regard to the use of an outboard motor. However, there remains a vast amount to be learned about the rail. At the present time we do not have available enough data to adjust the hunting season or bag limit.

It has been learned from the nesting data that there is a preference for a certain type marsh, yet the amount of this marsh, sufficient to account for the total nesting has not been located, nor have we any information on how to create or manage this marsh. To gather this information would in itself be a complete ecological study.

LITERATURE CITED

- Ridgway, Robert, continued by Friedman, Herbert, 1941. The birds of North and Middle America. U. S. Nat. Mus., Washington, D. C. Part IX: 50-56.
- Bent, Arthur Cleveland, 1926. Life histories of North American marsh birds. U. S. Nat. Mus. 135.
- Schmidt, F. V. & Kozicky, E. L., 1949. Nesting habits of the clapper rail in New Jersey. Auk. 60; 355-364.
- Small, John H., 1933. Manual of the southeastern flora. Sci. Press. Prt. Co., Lancaster, Pa.
- Johnson, Duncan S. & York, Harlan H., 1915. The relation of plants to tide-levels. Carnegie Inst. of Washington, Washington, D. C.
- Martin, A. C., Gensch, R. H. and Brown, C. P., 1946. Alternative methods in upland game bird food analysis. Jour. of Wildl. Mgt. 10:8-12 January.





THE SALT MARSH VEGETATION OF THE COAST OF GEORGIA

GEORGIA STATE GAME AND FISH COMMISSION
FEDERAL AID PROJECT

	SHEET 2 OF 2 SHEETS IN ACRES	TOTAL IN ACRES
JUNCUS ROEMERIANUS	12,928	28,399
SPARTINA ALTERNIFLORA	155,155	253,153
SPARTINA CYNOSUROIDES	61	2,825
JUNCUS ROEMERIANUS & SPARTINA ALTERNIFLORA	898	4,252
JUNCUS ROEMERIANUS & SPARTINA CYNOSUROIDES	1,428	6,361
SPARTINA ALTERNIFLORA & SPARTINA CYNOSUROIDES	0	1,063
JUNCUS ROEMERIANUS SPARTINA ALTERNIFLORA & SPARTINA CYNOSUROIDES	8,839	12,124
TOTAL ALL GRASSES	179,307	308,177

MILES 0 1 2 3 4
SCALE 8000



St. Catherine's Island Area 1948

MATCH LINE -

Wolf Island Area 1948

Rockdedundy Area 1948

Back River Area 1949

Terrys Creek Area 1949

Todd Creek Area 1949

Brickhill River Area 1948-49-50

A T L A N T I C



THE SALT MARSH VEGETATION OF THE COAST OF GEORGIA

GEORGIA STATE GAME AND FISH COMMISSION
FEDERAL AID PROJECT

	SHEET 1 OF 2 SHEETS IN ACRES	TOTAL IN ACRES
JUNCUS ROEMERIANUS	15.471	28,399
SPARTINA ALTERNIFLORA	97,998	253,153
SPARTINA CYNOSURDIOIDES	2,764	2,825
JUNCUS ROEMERIANUS & SPARTINA ALTERNIFLORA	3,350	4,252
JUNCUS ROEMERIANUS & SPARTINA CYNOSURDIOIDES	4,933	6,381
SPARTINA ALTERNIFLORA & SPARTINA CYNOSURDIOIDES	1,083	1,083
JUNCUS ROEMERIANUS SPARTINA ALTERNIFLORA & SPARTINA CYNOSURDIOIDES	3,285	12,124
TOTAL, ALL GRASSES	128,870	308,177

MILES 0 1 2 3 4
SCALE 60,000

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